ZPh-120
Physics Section



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GENERAL DYNAMICS | CONVAIR

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In a previous publication,[1] equations were developed for the computation of diatomic gas emissivities for an assumed model of an anharmonic vibrating rotator with the first approximation to the vibration-rotation interaction. This paper is an application of the results of that analysis to the OH molecule.

The fundamental band strength of the OH molecule was taken[2] as 100 $cm^{-2}$ $atm^{-1}$ at 300°K. In the absence of experimental data, the factor $\theta$ (the ratio of the zeroth to the first order term in the expansion of the electric dipole moment) and the average line width (which enters only in the strong line approximation) were assumed to be the same as for the HF molecule.

The results are presented in Figures 1 to 16, for both the weak line and the strong line approximations. Computations have also been made for the case of pure Doppler broadening and will be published in a separate report along with such computations for other diatomic molecules.[3]

## REFERENCES

1. W. Malkmus and A. Thomson, Convair Report ZPh-095, May 5, 1961; also in Journal of Molecular Spectroscopy and Radiative Transfer (to be published).

2. W. S. Benedict and E. K. Plyler, "High-Resolution Spectra of Hydrocarbon Flames," in Energy Transfer in Hot Gases, pp. 57-73, N. B. S. Circular No. 523, Washington, D. C., 1954.

3. W. Malkmus and A. Thomson, Convair Report ZPh-119 (to be published).

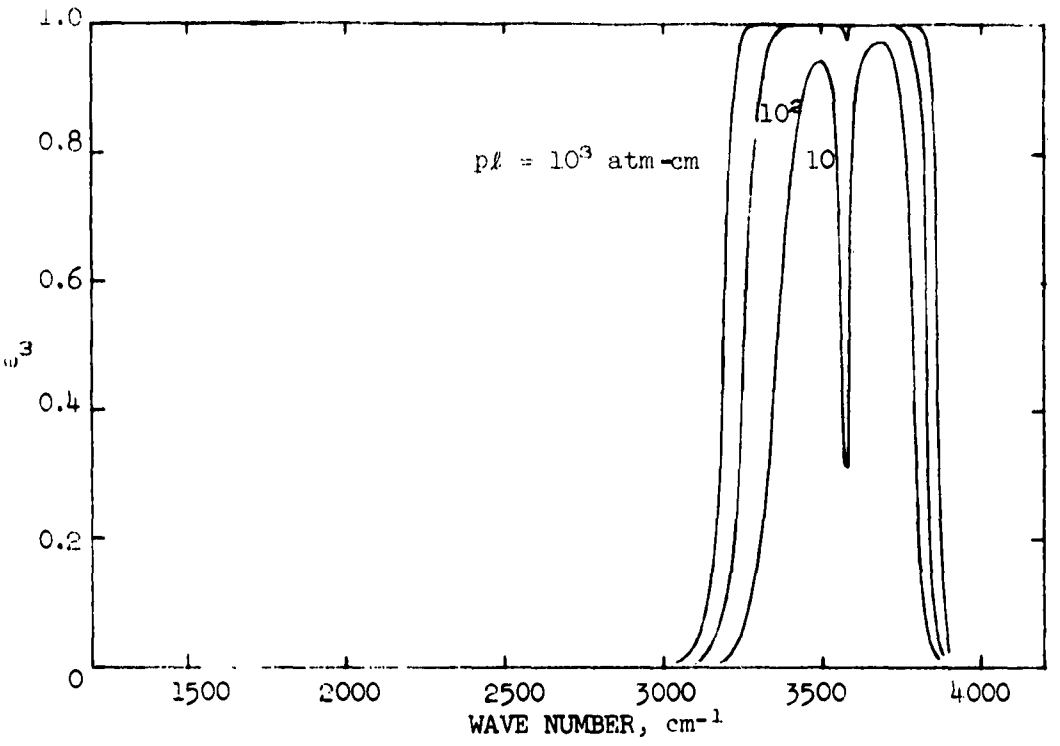


FIGURE 1. SPECTRAL EMISSIVITY OF OH AT T = 300°K
(Weak Line Approximation)

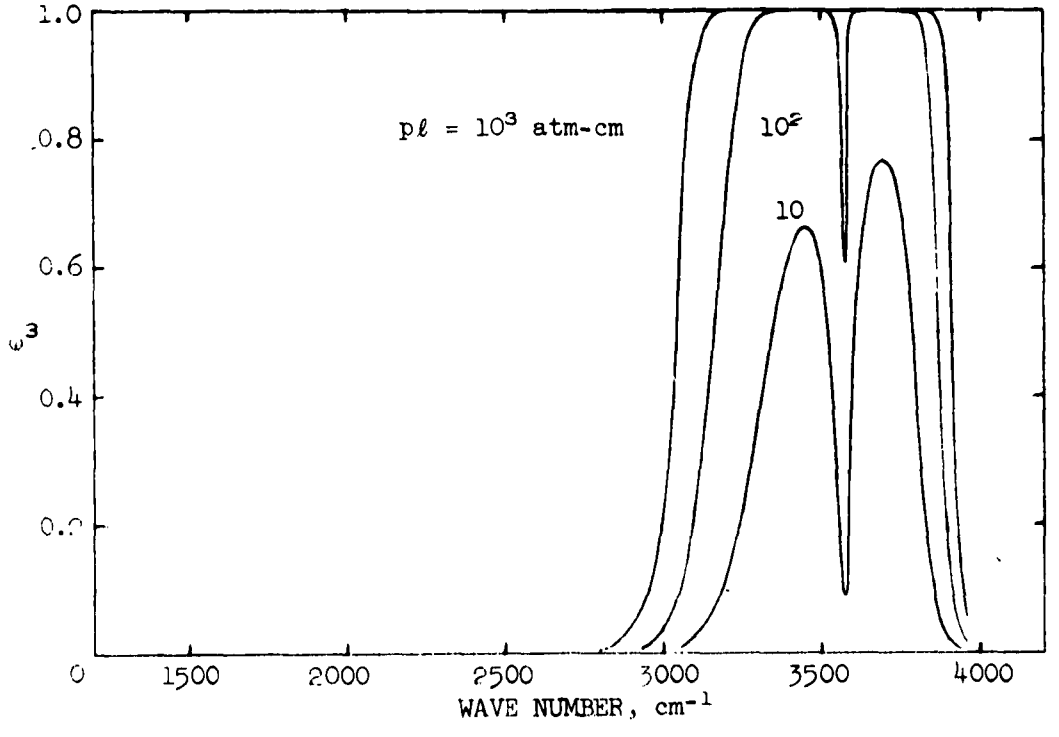


FIGURE 2. SPECTRAL EMISSIVITY OF OH AT T = 600°K
(Weak Line Approximation)

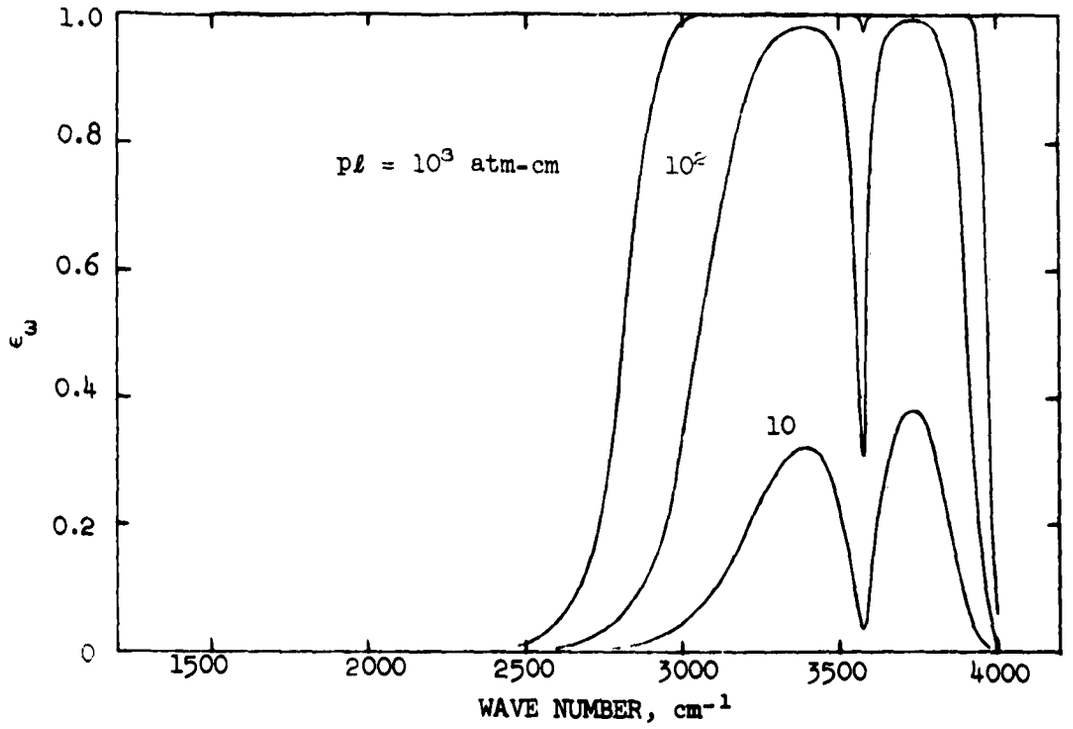


FIGURE 3. SPECTRAL EMISSIVITY OF OH AT T = 1200°K
(Weak Line Approximation)

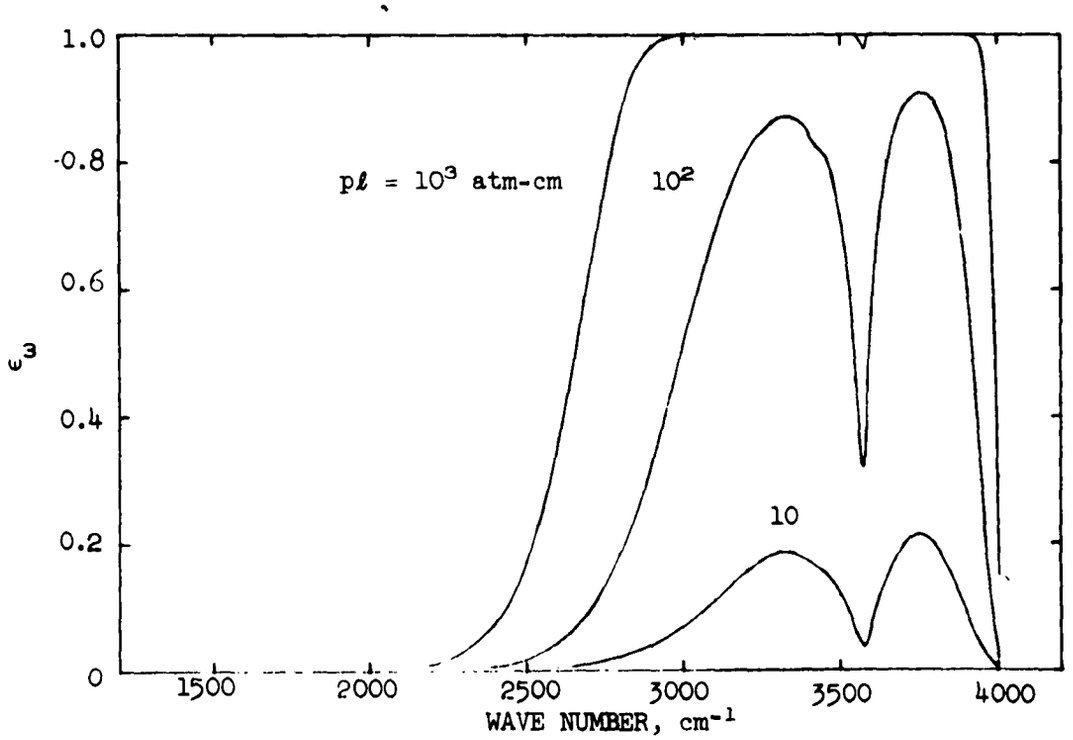


FIGURE 4. SPECTRAL EMISSIVITY OF OH AT T = 1800°K
(Weak Line Approximation)

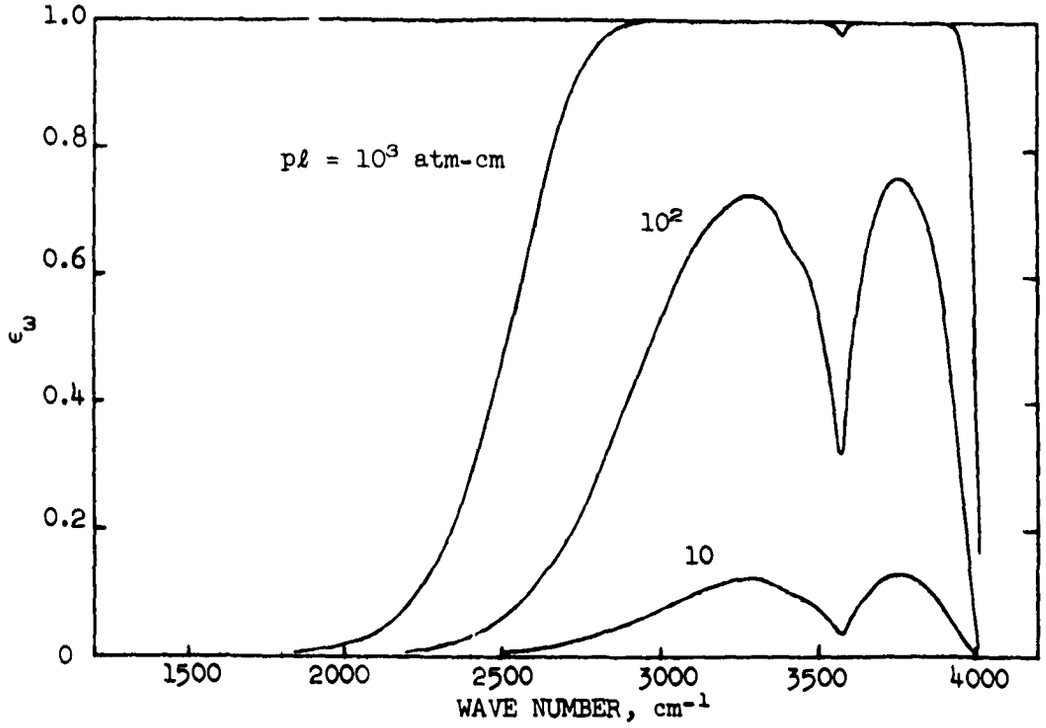


FIGURE 5. SPECTRAL EMISSIVITY OF OH AT T = 2400°K
(Weak Line Approximation)

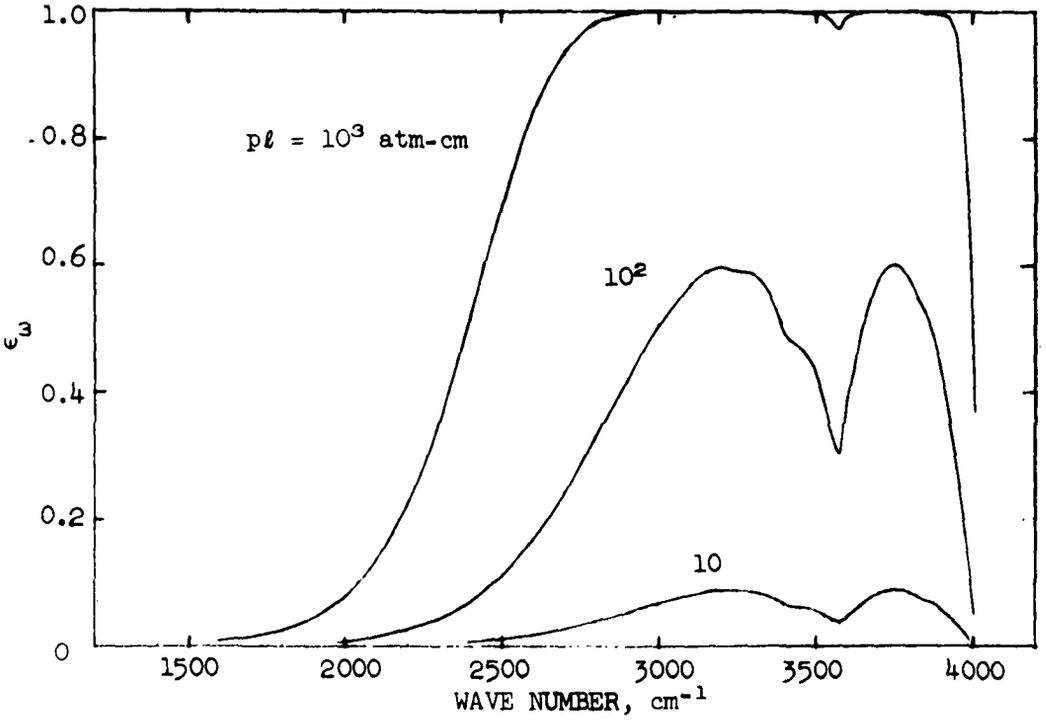


FIGURE 6. SPECTRAL EMISSIVITY OF OH AT T = 3000°K
(Weak Line Approximation)

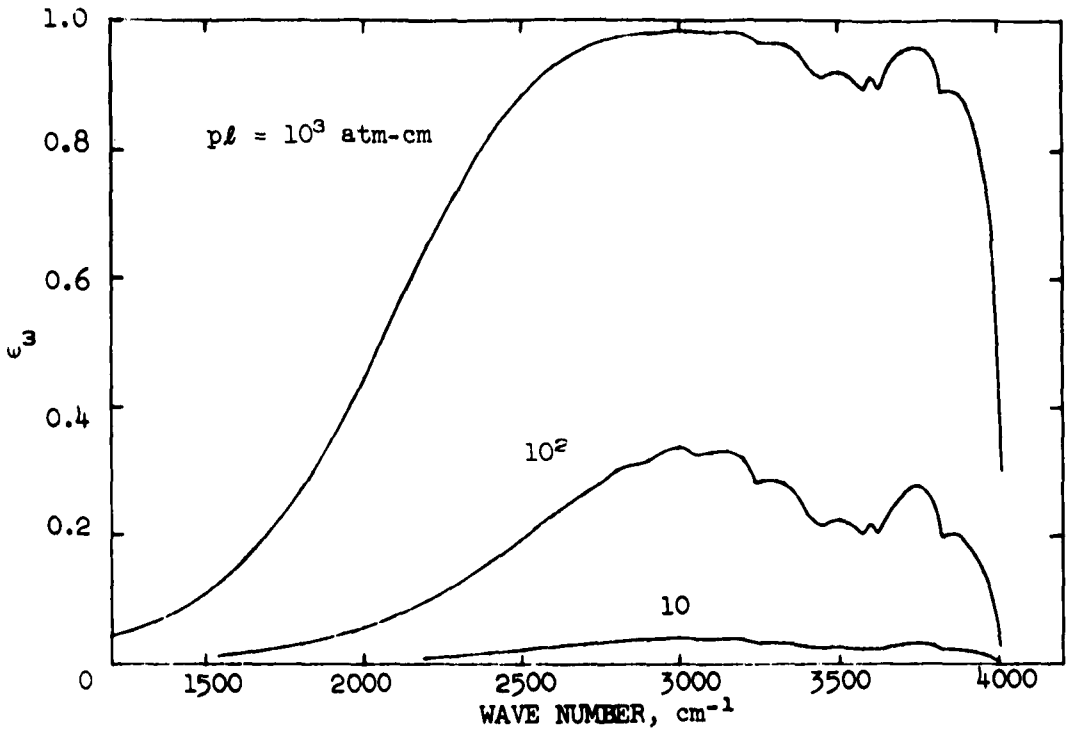


FIGURE 7. SPECTRAL EMISSIVITY OF OH AT T = 5000°K
(Weak Line Approximation)

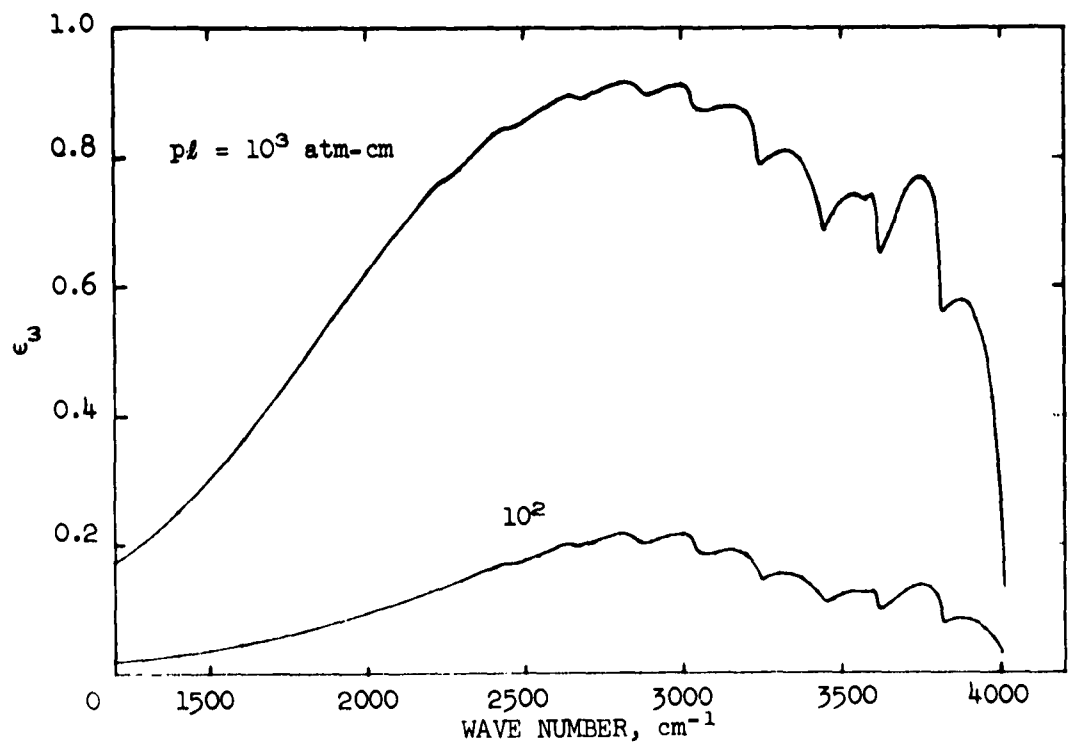


FIGURE 8. SPECTRAL EMISSIVITY OF OH AT T = 7000°K
(Weak Line Approximation)

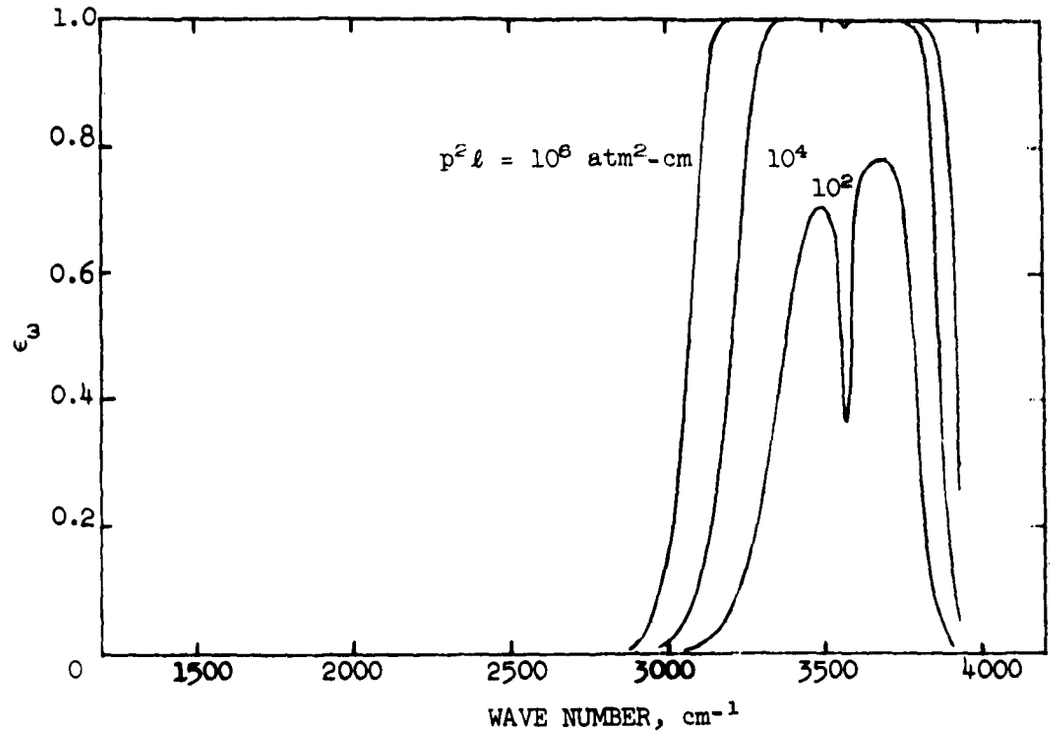


FIGURE 9. SPECTRAL EMISSIVITY OF OH AT T = 300°K
(Strong Line Approximation)

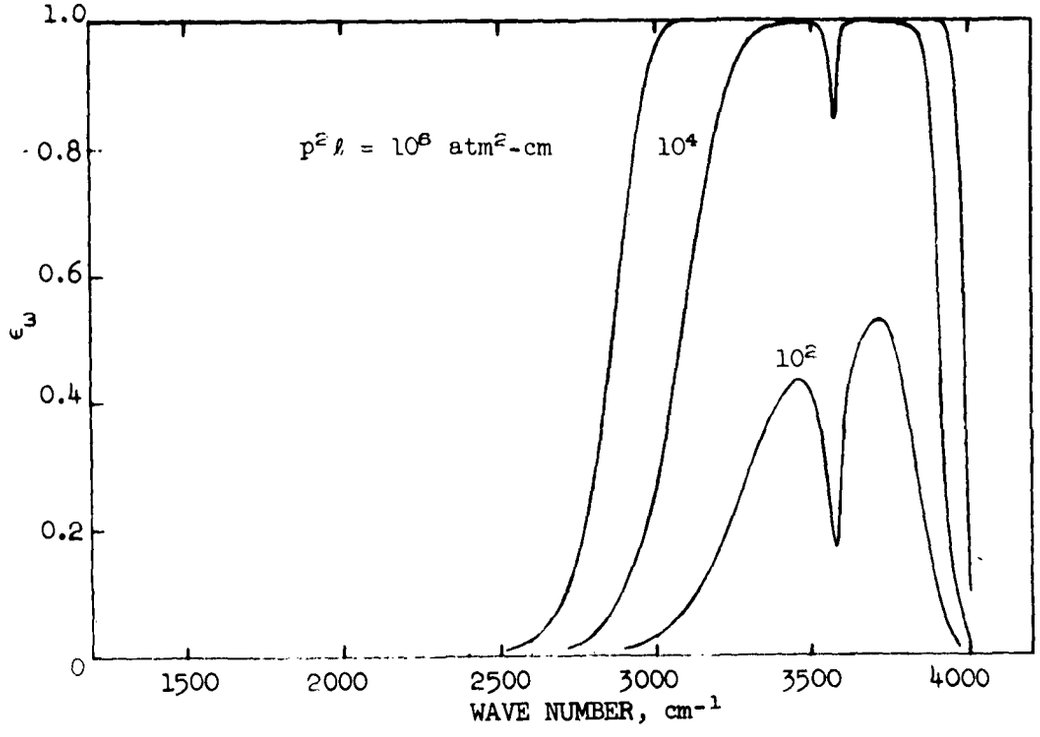


FIGURE 10. SPECTRAL EMISSIVITY OF OH AT T = 600°K
(Strong Line Approximation)

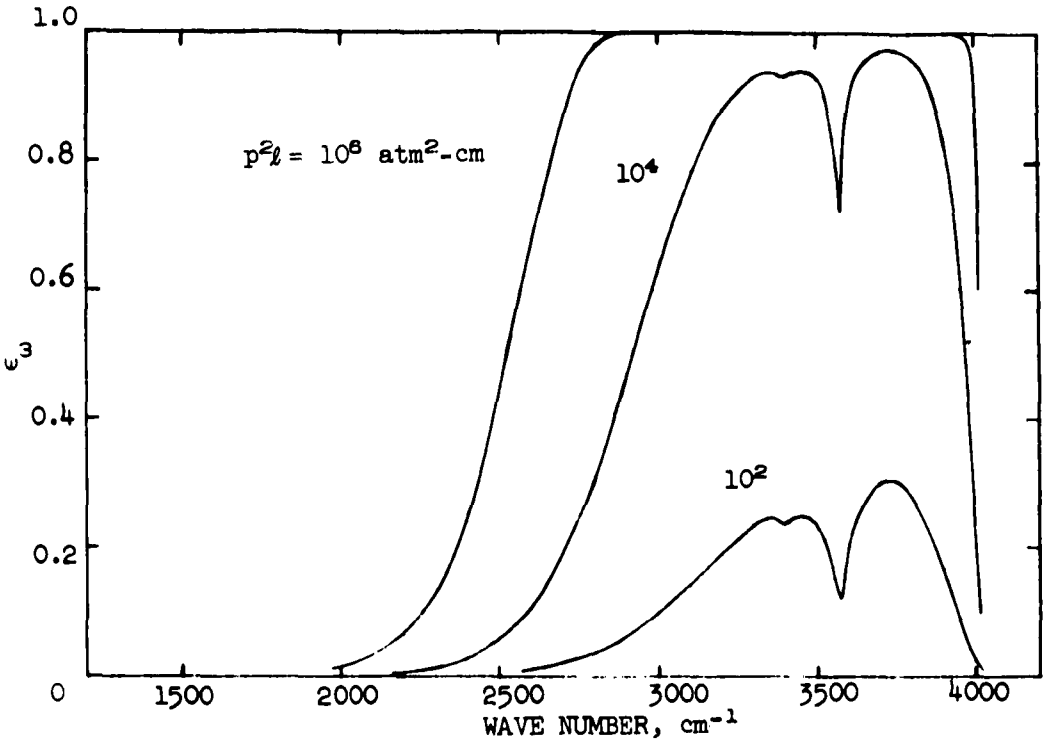


FIGURE 11. SPECTRAL EMISSIVITY OF OH AT T = 1200°K
(Strong Line Approximation)

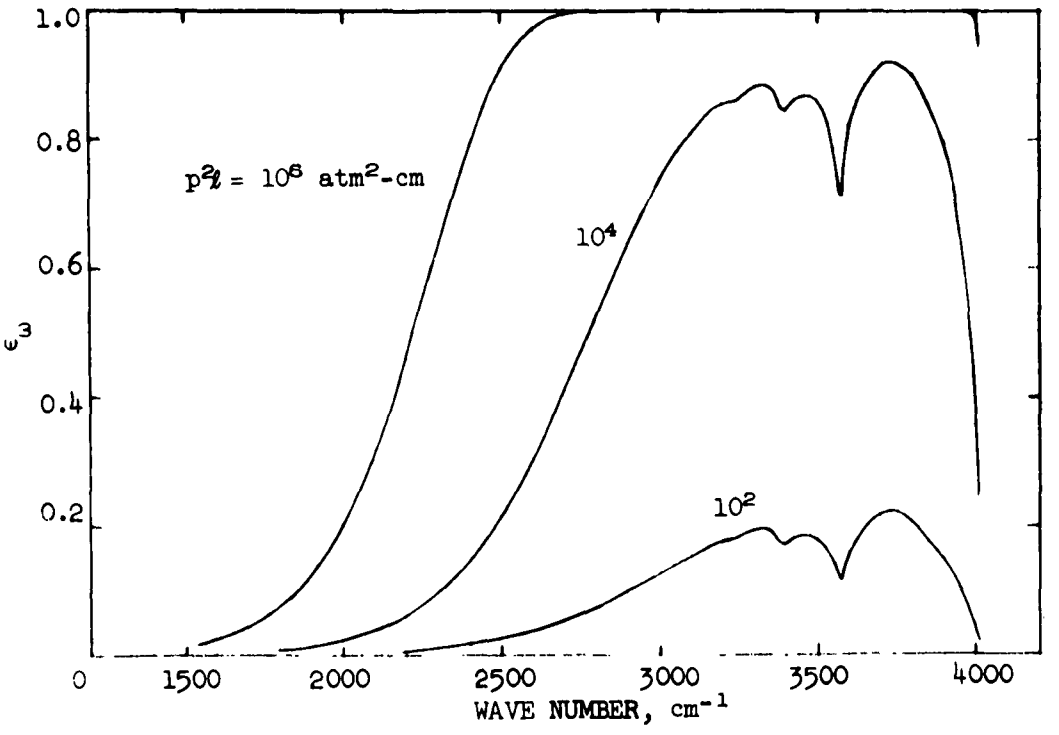


FIGURE 12. SPECTRAL EMISSIVITY OF OH AT T = 1800°K
(Strong Line Approximation)

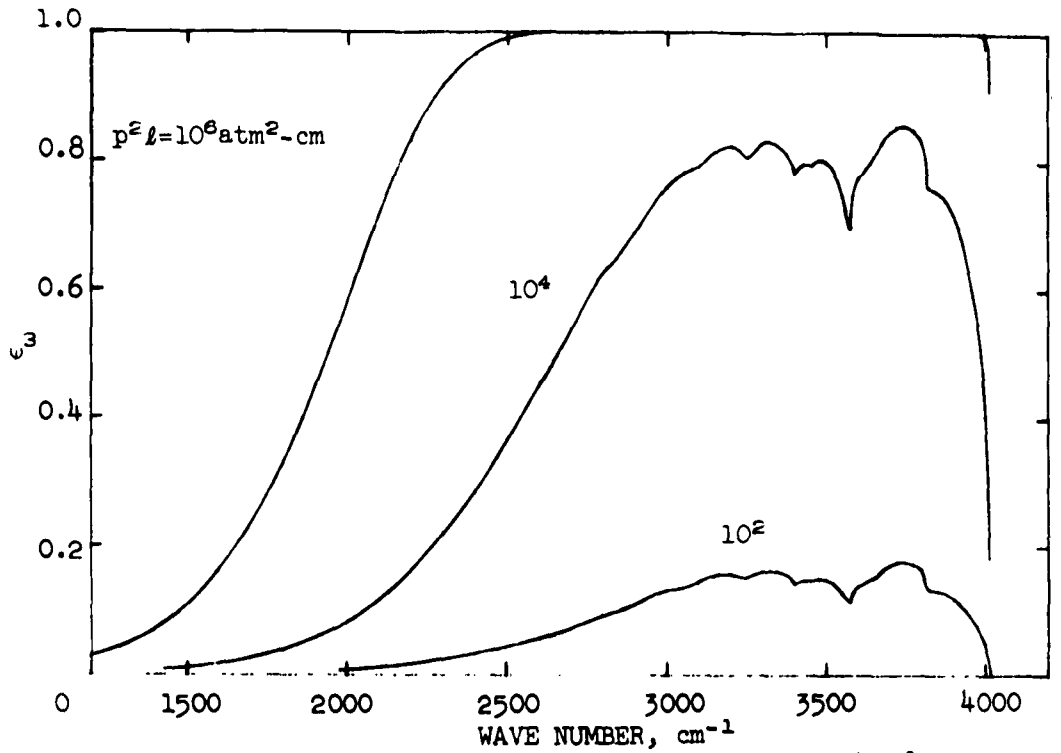


FIGURE 13. SPECTRAL EMISSIVITY OF OH AT T = 2400°K
(Strong Line Approximation)

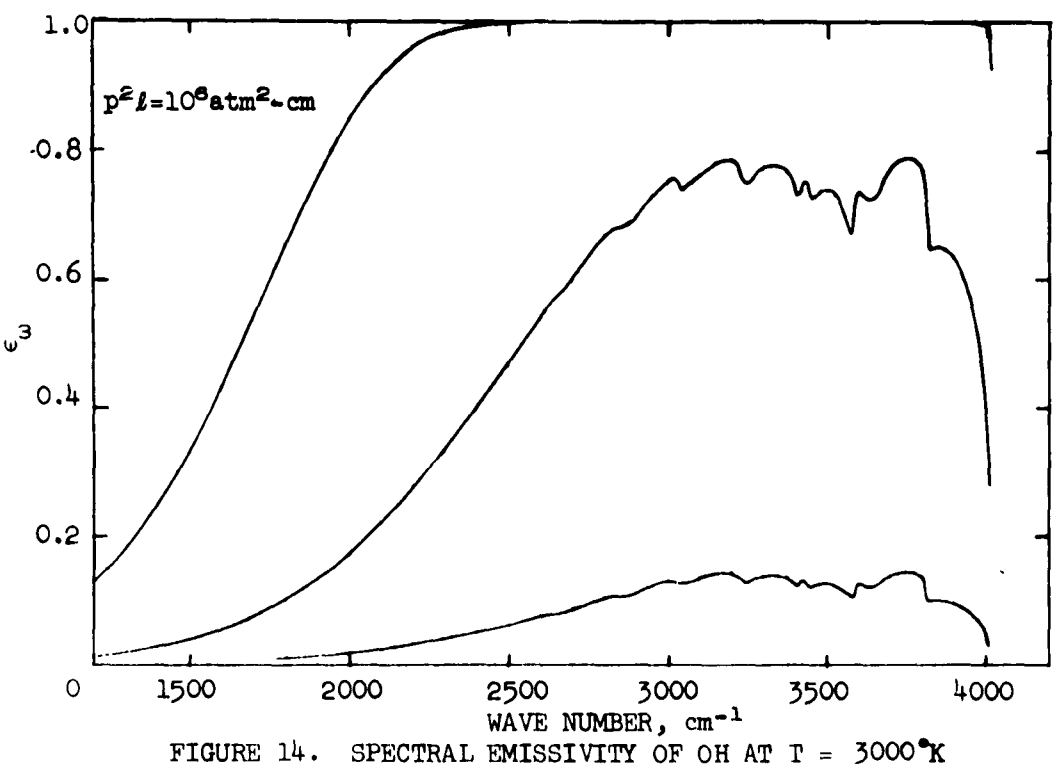


FIGURE 14. SPECTRAL EMISSIVITY OF OH AT T = 3000°K
(Strong Line Approximation)

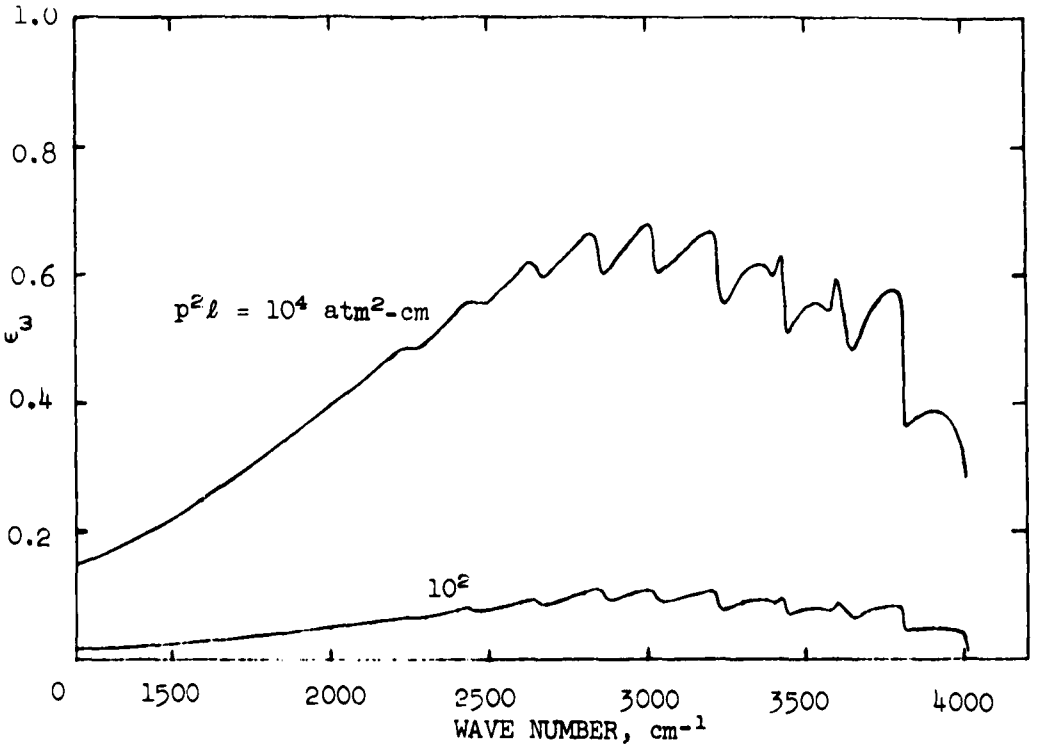


FIGURE 15. SPECTRAL EMISSIVITY OF OH AT T = 5000°K
(Strong Line Approximation)

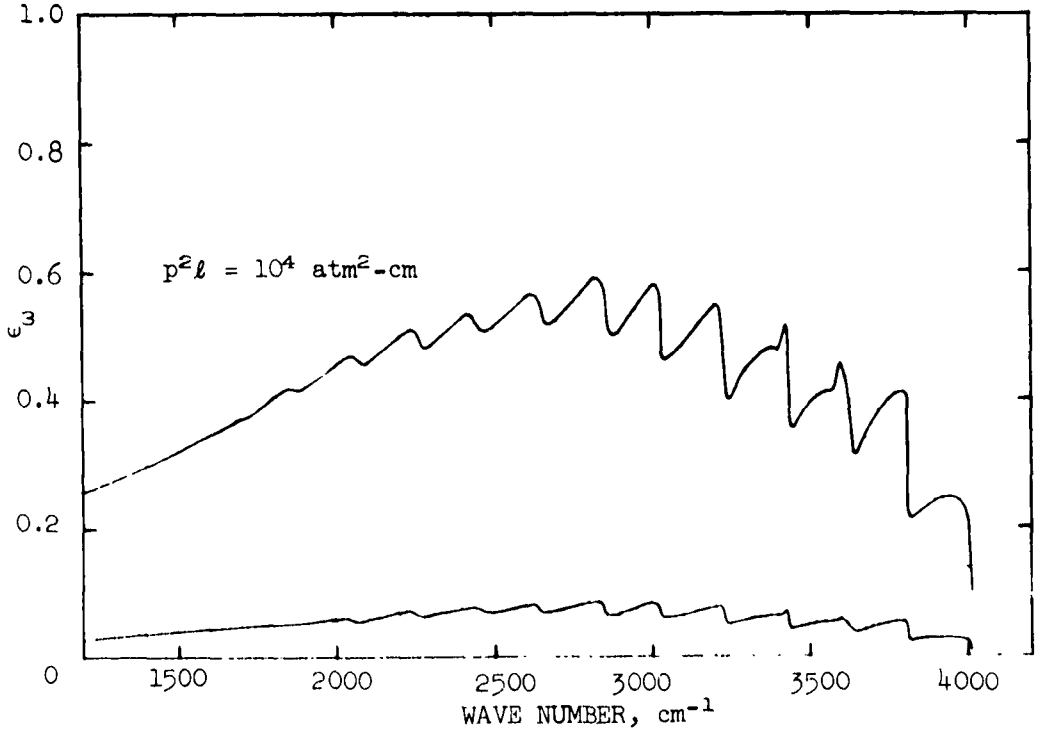


FIGURE 16. SPECTRAL EMISSIVITY OF OH AT T = 7000°K
(Strong Line Approximation)